

Performance Assessment of Selected Farmer Managed Irrigation System in Kaski District, Nepal

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Abstract

The performance of three Irrigation System (IS); *Arva Ghari*, *Tirkang Kimbesi* and *Hemja Sinchai Pranali* was assessed using the Focus Group Discussion (FGD) and structured interview. The IS situated in the Kaski district were managed by users committee which were mainly formed by the election. The water availability is sufficient in upstream and decreases towards downstream leading to tail end deprivation, however, there was no dominance of influential person in water allocation. Proper distribution system minimizes the conflict among the users which depends on the condition of the canal along with regulating structures. The deposits of silt on bed and vegetation on banks have reduced the discharge capacity which needs the regular maintenance for the better performance of the IS. Separate fund should be raised for the repair and maintenance of canal. FMIS should be supported to strengthen its capacity as these are yet to be institutionalized and genuine farmers should be encouraged to participate for the management of the IS.

Keywords: Irrigation system, water allocation, committee, distribution system.

1. Introduction:

Over the past 200 years, farmers in both hill and the Terai have developed simple irrigation systems by diverting water from seasonal or permanent streams and rivers, however, these systems are not reliable [1]. The need of irrigation management is due to the limited availability of utilizable water and growing need of water for irrigation. The performance of Irrigation System (IS) is gauged by area actually irrigated to the area planned to be irrigated, water logging, tail end deprivation and yield [2]. The IS must be managed to utilize the limited availability of water and its growing need. Farmer Managed Irrigation System (FMIS) were built for centuries and managed by themselves.

In Nepal, there were many numbers of FMIS which were built even in very difficult terrain without the aid of modern technology covering the substantial area of irrigated land [3]. FMIS system is successful systems as these are operated and maintained by the farmers themselves. The local materials such as mud, stone, forest products etc. were used for the construction of the irrigation infrastructures with local technology and traditional methods, practiced over many centuries. Local farmers are expert in construction skill for maintaining the alignment and canal bed slope [4].

Lam, 1998 [5] suggested a useful way to deal with the meaning of irrigation performance as to start by asking what kinds of problematic

situations are faced by people organizing irrigation and what are the characteristics of the problem in operation and maintenance works, fund shall be raised by the concerned farmers or they have to serve voluntarily. Unsatisfactory people's participation in sharing operation and maintenance and capital cost of system is the problem and constraint in irrigation development. For the strengthening of the traditional system and maintaining the operation and maintenance of FMIS intact without any interruption, a supportive program should be designed. This should be continued for the sustainability of their traditional system [6]. Bhatta et. al., 2005[7] conducted the study which revealed that equity in distribution of water and leakage had significantly improved after management transfer. Regmi, 2008 [8] in his paper stressed the need to develop effective institutions is as important as developing physical infrastructure. Malla and Khadka, 1997 [9] indicated that; lack of leadership and passiveness of water users' association, lack of definite rules for the operation of canals, problems of water stealing, controversy over labor contribution and sharing of water between old and new users are some of the problems in IS. The production of crops also depends upon the performance of the system. The active participation of the farmers is helpful for the allocation and distribution of water to the system. Therefore, it becomes important to study how the farmers participate in the irrigation system. Besides, the water allocation and distribution in FMIS becomes important issue for the study.

Water Users Association (WUA) is the autonomous and corporate body for implementing and executing the rules as mentioned in the section 5 and 6 of water resources act, 2049 (1992) of Nepal. Any water resources project developed can be handed over or transferred to WUA as per the provision of the section 11 of the same act. The authority, rules and responsibility of executive member for the management of IS is made by the general meeting of all members within the command area [10]. The equity aspect relates to both technical as well as social aspects of an IS. It is more significant than adequacy which does not necessarily mean equal distribution of water to everybody [11].

Though Nepal has numerous self-sustaining traditional FMISs, they are facing several challenges as competing water demand, socioeconomic transformation etc. [12]. As the demand is growing and crosses the available supply of water, disputes arise over water rights, especially for irrigation [9]. The increasing demand of water for irrigation purposes can only be fulfilled with the limited availability of water with the proper management which needs to supply right amount of water at right place and right time. To enhance the performance of the irrigation system, institutional aspects of Irrigation Management is to be strengthened. Now, the government policy mainly focused on local initiatives and farmer's participation in the planning, construction and management of the IS. Therefore, there is a need to study the level of farmer's participation in the management and various other aspects of IS.

There are thousands of FMIS in Nepal contributing irrigation services to seventy percent of the total irrigated area [14] and contributing forty percent of food requirement of the country [13]. The contribution of the FMIS for the crop production is more than the Agency Managed Irrigation System (AMIS) therefore it is necessary to study the FMIS in our context. The general objective of this research was to investigate the performance of some selected farmer managed irrigation system in Kaski district. This study mainly focused on the local initiatives for the management of IS. The specific objectives of this research were to explore the situation of farmer's participation in the management; to find the system of water allocation and distribution; to identify the system of operation and maintenance in the IS. This study could be helpful for the improvement of the system for the institutionalization of the management of IS.

2. Materials and Methods:

2.1. Study Area:

The research was carried out in some of the selected FMIS in Kaski district. The command area of three IS were selected as to cover the three distinct location of the Kaski district nearby Pokhara. Among the three IS, the command area of *Tirkang Kimbesi* Irrigation System is situated in Begnas, Lekhnath, Kaski.

The command area of *Hemja Sinchai Pranali Jal Upabhokta Sangh* lies in Hemja, western part of pokhara. Figure 1 shows the location of

command area of Hemja IS, Arva IS and *Tirkang Kimbesi* IS in Kaski district.

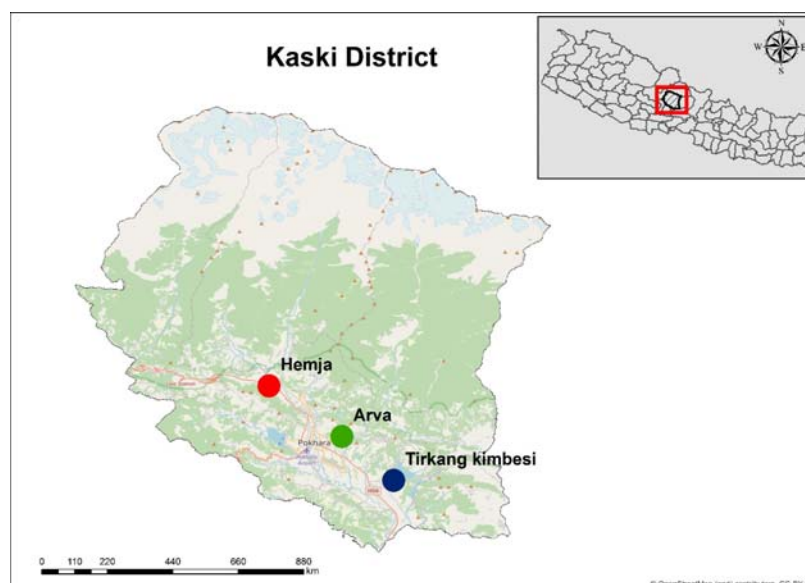


Figure 1: Location map showing the location of command area of *Hemja IS*, *Arva IS* and *Tirkang Kimbesi IS* in Kaski District, Nepal.

The command area of *Arva Ghari Kulo Sinchai Jal Upabhokta Samiti* situated in Arva, Kaski and this IS having around ninety farmers as a general member using the water for farming. It is locally known as Chaite Kulo as it was used for irrigation in paddy in the Nepali month of Chaitra (March/April). Some people do not cultivate paddy even in Ashad (June/July) as canal is silted and water could not be carried to the field as per the requirement

2.2. Research Design and Study Variables:

The primary data were collected using structured interview with the farmers of the selected command area. In addition, Focus Group Discussions (FGD) were carried out to farmers focusing on participation, water distribution and maintenance of IS. This research was carried out by the field visit to the respective sites and consultation with the member representatives of the respective FMIS. The performance of FMIS was measured on the basis of three independent variables such as Participation, Water distribution system and Operation and Maintenance system of IS. In case of evaluating participation, involvement of farmers in decision making process, farmer's representative in the management board and access to information

were identified. In relation to water distribution system, the quantity of water, method of distribution, rules of water delivery and timeliness, water logging and tail end deprivation were considered. Finally, for the operation and maintenance the allocated discharge, timing of distribution, condition of canal, cleanliness of canal and repair and maintenance schedule were accessed.

2.3. Sampling Size:

Non probability sampling technique was employed for the proposed study. Samples were selected on the basis of convenient sampling. The data were collected using purposive sampling technique with the general member as well as executive members of the IS. Out of 670 number of farmers associated with the three IS, 72 respondents (at the margin of 11 percent error and 95 percent of confidence level) were selected for interview.

Table 1: Position of Respondents Farmer's in IS

Position	Number	Percent
Executive Member	10	13.9
General Member	62	86.1
Total	72	100.0

Table 1 shows that out of the total 72 respondents, 10 are executive members including Chairman and Secretary of IS while other 62 are general members.

Table 2: Sample Size of Irrigation System

Irrigation System	Number	Percent
Tirkang Kimbesi Irrigation System	15	20.8
Arva Ghari Kulo Sinchai Jal Upabhokta Samiti	12	16.7
Hemja Sinchai Pranali Jal Upabhokta Sangh	45	62.5
Total	72	100.0

Table 2 shows that out of 72 respondents 12 are from *Arva Ghari Kulo Sinchai Jal Upabhokta Samiti*, Arva, Kaski while 15 are from *Tirkang Kimbesi Irrigation System*, the remaining 45 respondents are from *Hemja Sinchai Pranali Jal Upabhokta Sangh*, Hemja. The respondents from various irrigation system selected as per the total numbers of general members (farmers or users groups) connected to the respective IS.

2.4. Data Collection:

Questionnaire were prepared for taking data from the stake holders of the selected FMIS. Individual interviews and FGD were the major data collection tools and techniques. In the first section, there are questions related with Socio Demographic Characteristics of the Respondents.



Figure 2: Focal Group Discussion, Hemja Irrigation System

In other three section questions were arranged under the various heading according to the specific objectives of the research. Section A covers the general information and socio demographic characteristics of the respondents. Section B has 20 questions regarding the Level of farmer's participation and in Section C, there

are 18 questions for the data regarding Water Allocation and Distribution. Figure 2 shows the FGD with the general members while figure 3 shows the interview with the member of Hemja IS.



Figure 3: Interview with members of Hemja Irrigation System



Figure 4: Interview with general members of Kimbesi Irrigation System



Figure 5: Interview with general members of Arva Irrigation System

Finally, in section D, there are 11 question for Operation and Maintenance of Canal. All together there were forty-nine questions for each respondent. Structured interview, FGD, were used as the methods of data collection. The data were taken from the committee members and from the farmers representing upstream portion as well as downstream portion of the canal. Figures 4 and 5 shows the interview with the

general members of Kimbesi IS and Arva IS, respectively.

3. Result and Discussion:

3.1. Demographic Description of Respondents:

The brief descriptions of the demographic features are described in this section. The respondents were separated with respect to age, gender, caste, education, major occupation, family type and size they have etc. The name was optional but most of the respondents they told their name. More than one third respondents were between 46 to 60 years while more than one fourth were between 31 to 45 years. Fifty percent of the total respondents were Brahmin, more than one third were Chhetri while others were Janajati and Dalits. The major occupations of the respondents are categorized as shown as in Fig. 6. More than two third have their occupation as agriculture while one in six has job. More than five percent has business too whereas nearly one in ten has other occupation including wage and labor.

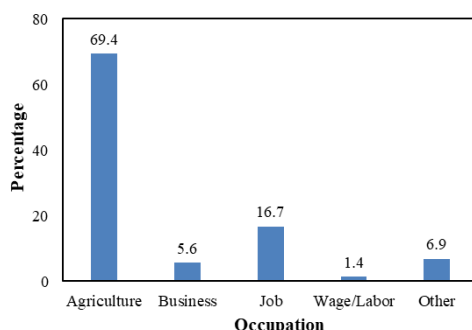


Figure 6: Major Occupation of the Respondent

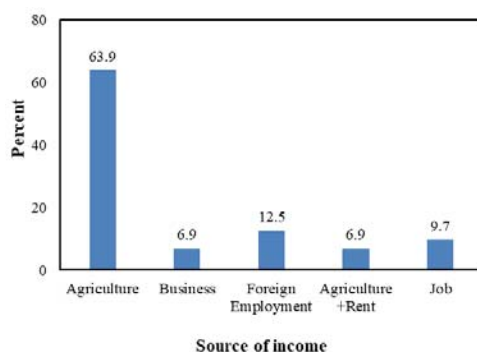


Figure 7: Major Income Source of the Respondent

The majority of the respondents do have agriculture as a source of income. More than one in ten has foreign employment while nearly seven percent has business as a source of income. Nearly one in ten has job while nearly seven percent has agriculture as well as rent as a source of income which can be seen in Fig. 7.

3.2. Level of Farmer's Participation in the Management of the Irrigation System:

This section intends to find the level of farmer's participation in the management of irrigation system. The study shows that, almost ninety percent of the respondents uses canal water as the major sources for irrigation. Less than seven percent respondents depend on rainfall while less than five percent uses other sources of water as an irrigation. Figure 8 shows that more than fifty percent responded that the executive committee formed by election while one in sixth said that the committee formed unanimously. Nearly one in tenth responded that there is nomination of members in the executive committee, while fifteen percent of the respondents do not know regarding the formation of executive committee.

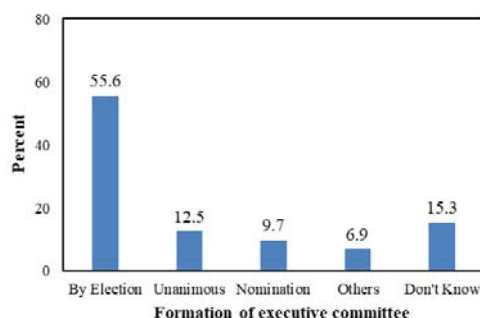


Figure 8: Methods of Executive Committee Formation

Figure 9 shows that more than one third respondents knew the information of meeting by their neighbor while one in five through public notice. Very few people got the information through SMS. Nearly one third reacted that they don't know the information regarding the information of the general meeting. In the past, people were informed through katuwal but now days the means of information has been changed.

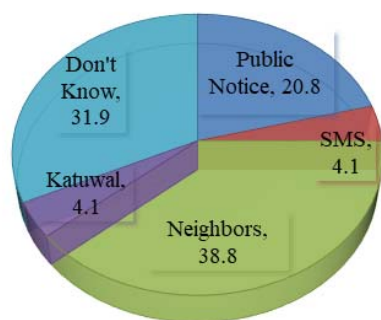


Figure 9: Meeting information

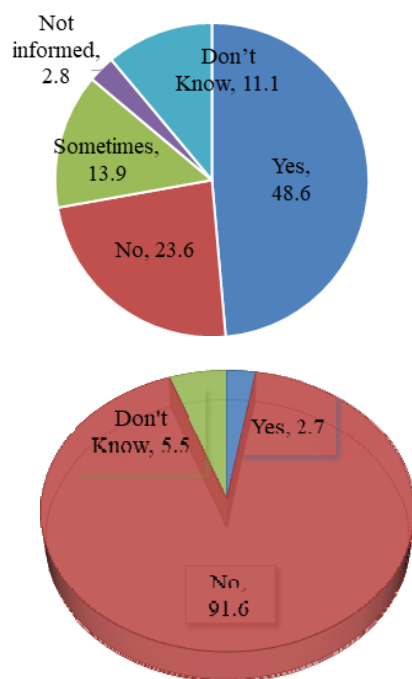


Figure 10: Participation in General Assembly and Punishment for Absentees

Figure 10 shows that nearly fifty percent of respondents participated in the general assembly while more than one in five did not participate. Nearly 14 percent participated sometimes while more than one in tenth did not know about the general assembly. All most three percent not informed for the general assembly. More than ninety percent responded that there was not practice of punishment for the absentees in the meeting.

More than one third respondents gave suggestions in the general assembly, and 78 percent of their suggestions addressed by the executive committee. Nearly one in four respondents participated with just having

attendance while less than five percent asked the question in the meeting as shown as in the Table 3.

Table 3: Involvement in Meeting

Involvement	Number	Percent
Just having attendance	17	23.6
Asking question	3	4.2
Giving suggestions	25	34.7
Other	8	11.1
Don't Know	19	26.4
Total	72	100.0

Table 4 shows that nearly two third responded that the problem arises in the irrigation system was solved by the executive committee. One in ten responded for the need of mass meeting while fifteen percent stressed for the general assembly to solve the problem. About forty-five percent of respondents renew their membership in time while same number of respondents did not renew their membership in time. Around one in ten don't know about the renewal of their membership.

Table 4: Problem Solution

Problem Solved in IS	Number	Percent
Executive	45	62.5
General Assembly	11	15.3
Mass Meeting	8	11.1
DoI	2	2.8
Don't Know	6	8.3
Total	72	100

3.3. The System of Water Allocation and Distribution in the Irrigation System:

This section deals regarding the system of water allocation and distribution. The supply of water to the individual farmer's field and the sufficiency and its availability from upstream to downstream was also analyzed as the respondents were from top to bottom.

More than one third responded that the water is moderately sufficient and nearly one third reacted water availability as a sufficient while almost seventeen percent received low quantity of water. Around thirteen percent said that the acute scarcity of water for the irrigation as shown in the Fig. 11.

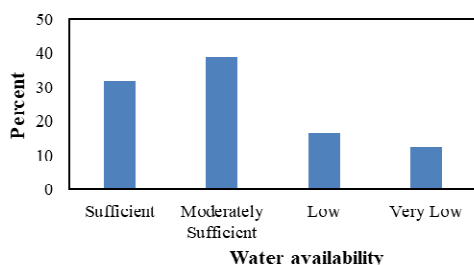


Figure 11: Sufficiency of Water

The farmers in the upstream area can get the water as required and some time they may draw more than enough and also because of seepage losses the discharges in the downstream portion of canal may not be sufficient to distribute all the farmers as per the requirement which is how the water availability varies with the location. Nearly fifty percent responded that the water is distributed continuously while forty percent responded that the water distributed alternately. One in ten respondents reacted that the supply is intermittent (as shown in Fig. 12). Table 5 shows that more than fifty percent responded as there was established distribution rule for the water distribution while forty percent responded against it. More than fifty percent claimed the scarcity of water at the down reach of the canal which shows the tail end deprivation. Around twenty percent respondents agreed the dominance of influential people while three in four responded that there is no dominance of influential people.

Water is contaminated with the domestic waste water as more than eighty percent respondents claimed that the water is dirty with domestic waste. Nearly two third respondents have willingness to pay Irrigation Service Fee (as shown in Table 5).

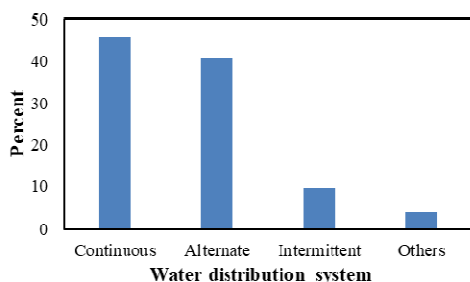


Figure 12: Water Distribution System

Almost all people said there was no metering of water while using in the field or on the outlet of the canal this shows that the water tax cannot be raised on the basis of the volume to water used. However, three in four responded that there was proportional allocation (distribution) of water according to farm land.

3.4. The System of Operation and Maintenance in the Irrigation System:

In this section condition of canal, its maintenance schedule and involvement of farmer for the maintenance of structures were studied. The users committee has the overall responsibility for the repair and maintenance of the canal and other regulating structures. Generally, the canal as well as regulating structures were maintained before the monsoon by the committee and cleaned with the collective effort of farmers for the smooth operation of the canal. The irrigation fee collected from the farmer was also used for the repairing and cleaning of the major components of the canal system. The users committee used to do the minor repair and maintenance work by themselves while for the major maintenance work such as maintenance or repairing of headwork; they need the source of fund from external sources such as local authority, government agencies and other organizations. The farmers cleaned and maintained particularly the water course from the outlet to their field themselves.

Figure 13 shows the condition of canal which indicates that the canal is in good condition in most of the section as the majority of responded reacted positively. The study shows that around one third respondents participated as one person from a house while very few participated according to their land size for the maintenance of the canal. More than one third didn't know the rule of participation in the maintenance of the canal. Around two third respondents involved in the cleaning of the canal once in a year while fifteen percent farmer cleaned the canal twice in a year. Around one in five don't know regarding this information.

Around two third respondents spent less than seven days for the operation and maintenance of the canal while around one in ten involved for

seven to fourteen day. One in five don't know regarding the operation and maintenance of the canal as per the research conducted. Some of the land cultivated by the tenants and the land owner directly not involved in the agricultural activities which affect the participation in the maintenance and operation of the canal.

Table 5: General Description on Distribution of Water

Description	Yes	No
Equitable Distribution	56.9	40.3
Tail and Deprivation	51.4	36.1
Dominance of Influential people	19.4	77.8
Contamination with domestic waste	80.6	19.4
Willingness to pay ISF	62.5	36.1

Figure 14 shows that one in five respondents pay for the operation and maintenance of the canal while majority of the respondents do not pay for the operation and maintenance of the canal. But almost all the farmers were ready for paying irrigation service fee once in a year if they assured for getting proper water in their field.

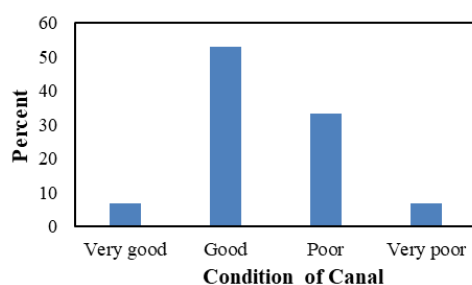


Figure 13: Condition of canal

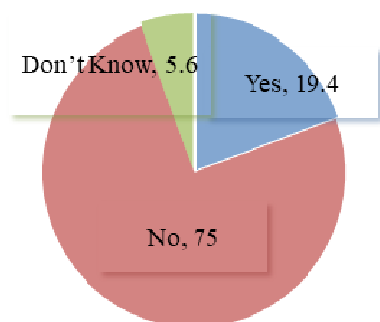


Figure 14: Payment for Operation and Maintenance

All the aspects described in this section briefly summarized and suggested for the improvement

for the overall performance of the FMIS as: Agriculture is the major occupation of more than two third respondents and nearly the same number of farmers have agriculture as a major source of income. The farmers initiated and involved in the management of their IS.



Figure 15: Headwork and canal at various reach of Hemja Irrigation System.

The executive committee of the user's association found to be capable to solve the problem arises among them and in their system. Though the committee successfully managed IS to some extent, the institutional aspects should yet to be strengthened. The operating rules made by the overall consensus of majority of the farmers and its implementation leads the sustainability of FMIS. The dispute arises regarding the quantity of water between the upstream and downstream reach of the canal which can be minimized by the proportional distribution of water as per the established rule set by the general meeting of the farmers. For avoiding the tail end deprivation, the canal should be cleaned regularly and should be kept intact with proper maintenance work on regular basis. To achieve the more and more involvement of the farmers, the executive committee should focus on awareness campaigning which helps the real water users to participate in the management and also in the

operation and maintenance of the canal system. Figures 15 and 16 shows the headworks and canal at various reach of Hemja and Kimbesi IS.



Figure 16: Headwork and main canal of Kimbesi Irrigation System

4. Conclusion:

The study of performances of FMIS was carried out in the three IS inside Kaski district using FGD and structured interview. The various tools for the assessment of performance are participation of farmers in the management, water allocation and distribution, maintenance and operation of the canal system.

The IS is managed by the users committee which are mainly formed by the election and in some cases unanimously among the stakeholders. Nearly half of the users are inactive and they are even not participating in the general assembly while some of the members participate actively in the management. The problem arises in the system, in most of the cases is solved by the executive committee.

The water availability is sufficient in the upper reach while it is moderately sufficient in the middle reach of the canal. Water is somehow distributed proportional to the land area but the farmers in the lower reach are facing tail end deprivation. The study shows that there is no dominance of influential person in distribution system. The distribution system was mostly continuous supplying throughout the entire rainy season and in alternative basis during the dry season. Water is contaminated with the domestic waste and deposition of solid waste mainly polythene bags will affect the fertility of the soil in the long run.

The condition of the canal along with regulating structures affects the distribution system of water. Mostly the canal is cleaned once in a year

in the beginning of the monsoon with the participation of one person from a house which is not sufficient and it should be cleaned regularly. Those who are not involved in the cleaning as well as operation and maintenance of the canal should be punished with some fine and the genuine farmers should be encouraged to participate for the management of the IS. The members of the users committee can pay the irrigation service fee if the committee make the awareness among the groups. Separate fund should be raised for the repair and maintenance of canal and its regulating structures. FMIS should be supported to strengthen its capacity as these are yet to be institutionalized.

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Conflicts of Interest:

The author declare no conflict of interest.

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